

ON THE ANATOMY OF TWO LAND MOLLUSCS (*HELICARION* (?)
WILLEYANA AND *H.* (?) *WOODWARDI*, N.SPP.) FROM NEW
 BRITAIN AND LIFU, LOYALTY ISLANDS, COLLECTED BY
 DR. ARTHUR WILLEY, F.R.S., IN 1895-97.

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PLATE IX.

THE two species which I describe in this paper were entrusted to me with several others by our late lamented Secretary, Martin F. Woodward, saying he thought they would interest me. It was the last time I saw him, and it has naturally been a matter of deep regret to me, throughout the time devoted to these shells, that, with other members of this Society especially, I can never receive again his real, sympathetic and valuable aid in work of this nature. Of the remaining species, which are all small forms, I hope to communicate descriptions later on.

Those who have worked at these small glassy shells know how extremely difficult it is to determine their species: the question of their generic position is in many cases even more difficult—I may say impossible—to solve from the shell characters alone. The animals, however, when well preserved—and Dr. Willey's specimens were—present in many points of their anatomy characters which are distinct enough to render determination quite easy, and this is well shown on a comparison of the soft parts of the two animals now described. Generic determination, as in this case, will not become easier until more is known of the animals of the various genera and subgenera living in the part of the world from which these species come. So many species are only partly known, often owing to the paucity and bad preservation of material; sometimes only the shell and radula have been described. For this reason I have placed both Dr. Willey's species in *Helicarion*, a genus which already contains a very varied lot of animals. I consider we have not yet arrived at the stage when subgeneric divisions can be made with satisfactory results, and while so much new and fresh material has yet to be collected in the many thousand islands of the Malay Archipelago and Pacific Ocean.

1. *HELICARION* (?) *WILLEYANA*, n.sp.

Hab.—Gazelle Peninsula, New Britain (Dr. A. Willey).

The shell, which has five whorls, is quite smooth. The animal (Figs. 1, 1*a*, 1*b*) has an extremely long foot, with a well-developed, overhanging lobe above the mucous gland; it is rounded above, with

a well-marked furrow lying in the centre line, from which the main parallel side furrows are given off. The general colour is pale horny, with darkish grey near the tentacles and extremity of the foot. The sole of the foot is narrow, with a distinct central area. The peripodial margin is broad, with indistinct fringe lines, and two close parallel lines above it. Both the right and left shell-lobes are large, broad, elongate, and thin; on both can be seen a central vein, with branch veins leading towards the margin. The right dorsal lobe is rather small, the left is in two distinct parts; the posterior, although so extremely thin and transparent, was very well seen. It is evident that in life the shell-lobes spread over the entire upper surface of the shell.

The generative organs (Fig. 1c) are simple. The penis is seen on the left dorsal side on removing the mantle-zone (Fig. 1a); it is bent on itself. The position of the retractor muscle cannot be made out, but it very probably has its attachment at this point; a muscle attachment is seen lower down. The spermatophore is indicated at the distal end by some regular oblique folds. The vas deferens is an extremely thin thread, becoming larger and more swollen close to the male organ, along the side of which it is attached by muscular tissue. The spermatheca is short, with a blunt knob, pointed where the retractor muscle is attached; the latter is large and flat, and nearly as long as the spermatheca. The free oviduct above is narrow, long, and coiled.

The jaw (Fig. 1d) is concave on the cutting edge with a central projection. The radula (Fig. 1e) in the single specimen examined is evidently abnormal in all the central area; the centre tooth could not be seen (by analogy it would be of the usual tricuspoid form); the admedian teeth are very irregular in size and form, the plates having developed, at their point of origin, two or three together; the type of admedian teeth could, however, be discerned on one side, where five of the plates became regular and normal, and they present one single tooth with a small cusp on the outer side; the marginals that follow are curved and bicuspid, the inner point being longer than the outer. They are quite perfect in form. The formula would, I estimate, be 35 : 12 : 1 : 12 : 35; taking the total breadth of the radula, in its central area, and the number of admedian teeth that would fill the interval; it is also pretty clearly seen whether two or three teeth are grown together. There is only one other specimen left, which shows the form of the animal and its mantle-lobes so well that I have refrained cutting it up merely to extract another radula.

The interesting points in this species are the great length of the foot and the great expanse of the shell-lobes, with the conspicuous central vein. The Doctors Sarasin, in their work "Die Land-Mollusken von Celebes," pl. xvii, fig. 149, show a somewhat similar veined structure in the large right shell-lobe of *Helicarion Idæ*. The radula is of a different type, with multiserrated marginals, and the foot of the animal is widely different in form from that of the present species, so I think it safe to say this New Britain form has little relationship with that species.

In this species the following characters may be also noted: (1) the absence of the amatorial organ; (2) the simple form of the penis, with no kalk-sac or cæcum at the retractor muscle; (3) the very small number of teeth in each row of the radula, that is to say, the radula is very narrow as compared with those of some species of *Helicarion*. Thus far it agrees with *Helicarion permolle*, Stoliczka, from Penang, and as regards characters 1 and 2 with *H. Kükenthalii* and *H. Halmaherica*, Kobelt, from the Celebes, but in these two last the type of radula is quite different; they have 320 and 602 teeth respectively in each row, as against only 95 in *H. Willeyana*. It does not agree with *Lamprocystis*, as typified by *L. succinea*, for in this genus Pfeffer places several ovoviviparous species, and we find this last character common to *Microcystis* and *Fretum*, Sykes (= *Euryppus*, Semper). It finds no place in Semper's group with chitinous papillate structure in the penis, his 'Reizepapillen' (= *Pseudhelicarion* of Von Möllendorff; type *Helix ceratodes*, Pfr.).

It is interesting to note that in the simple form of the penis, combined with the absence of the amatorial organ, this species agrees exactly with *Videna*, *Discus*, etc. (*vide* Wiegmann), *Dendrotrochus conicoides*, *Trochomorpha timorensis*, *T. planorbis*, and *T. lardea* (see also Proc. Malac. Soc., vol. i, pl. xix, fig. 3, *Discus bicolor*). Although these species have no shell-lobes, while their shells are discoidal, sharply keeled and altogether so very different to the globose shells of Dr. Willey's collecting, may not their relationship lie in the above-named direction rather than with chlamydate molluscs inhabiting the same region, but having a distinct origination.

2. HELICARION (?) WOODWARDI, n.sp.

Hab.—Lifu and Island of Pines, Loyalty Islands (Dr. A. Willey).

Shell (Fig. 2*g*) imperforate, very globose, shiny; sculpture consisting of beautiful, fine, regular, somewhat wavy, longitudinal striation, broken up by very fine transverse grooves into minute dots; the colour in one example is of a pinkish tint, in two others it is paler and greyer; spire depressed, suture very shallow, apex flatly convex; whorls 4, regularly increasing; aperture broadly lunate, oblique; peristome thin, slightly reflected near the umbilicus. Major diameter 7.25 mm., and of a specimen from the Island of Pines, 7.75 mm.

Animal (Figs. 2, 2*a*, 2*b*) pale-coloured, with a broadish dark band on either side of the neck, separated by a pale dorsal space, and having two very distinct parallel grooves on the central line broken up by cross grooves into oblong spaces. The foot has a short horn above the mucous gland, and the peripodial margin is distinctly fringed; the foot beneath is divided. The right shell-lobe is broad, and narrows rapidly. The left shell-lobe (Figs. 2, 2*a*, 2*b*) is broad and well developed, larger decidedly than the right. The dorsal wall of the branchial sac is black, mottled, and streaked with white.

Genitalia (Figs. 2*c*, 2*d*).—The retractor muscle of the penis is attached to a short straight cæcum, at the base of which the vas deferens enters; this last, slightly convoluted, lies close against the lower thick body of the male organ up to its basal end. Under

